

SCIENCE



Why the marine sciences are important for Singapore

Science Talk

INTO THE DEEP

Peter Ng, Staffan Kjelleberg and Serena Teo

Singapore is surrounded by blue. The seas are treasure troves of biodiversity, wells of untapped resources, and also help to connect this island nation to South-east Asia and beyond.

But fish – just like trash, invasive non-native species, microbes, nutrients and pollutants – do not recognise geopolitical borders. They mix and flow across these interconnected marine realms.

Marine issues cannot therefore be managed by one country. Even if the problems are external to Asean, the issues are magnified within South-east Asia, in politically sensitive areas such as the South China Sea.

Problems of pollution, marine traffic, invasive species, natural resources from timber to fisheries, conservation, sustainable trade in biosources, international treaties on ballast water discharged by ships, genetic resources of the high seas and so on are transboundary in nature, and solutions require close collaboration and sharing of scientific data across countries.

As Singapore continues to increase engagement in shared regional resources, there is a need to accept shared responsibilities.

The country is, after all, also heavily dependent on global knowledge for it to strengthen its economy

and capabilities. Singapore has an increasing role complementing our Asean and international partners in a multitude of ecological and sustainability issues, some aspects of which will overlap with our climate change challenges.

SEA SCIENCE

In 2016, the National Research Foundation established the Marine Science Research and Development Programme (MSRDP).

Over its tenure, which ends this year, the MSRDP set a precedent for marine science research, and brought out the best in the island's resident scientists and their international collaborators.

The programme funded 33 projects, including studies on ocean acidification, the resilience of coral reefs in Singapore to environmental change, and how seawalls here can be engineered to enhance biodiversity, among others.

These efforts involved 88 research scientists from eight institutions of higher learning, and delivered more than 160 published peer-reviewed papers.

Its success has led to the establishment of a new initiative – the Marine Climate Change Science programme, which will be implemented by the National Parks Board.

The new programme will have a focus on impending climatic

changes facing our seas and innovative research topics including blue carbon (carbon stored in marine ecosystems like mangroves), long-term marine ecosystem resilience and coastal eco-engineering that could look at projects on how to protect coastlines from the rising tides.

The knowledge generated will be important in positioning Singapore as a regional and international leader in using nature-based climate change science for the tropical marine domain.

BEYOND CLIMATE CHANGE

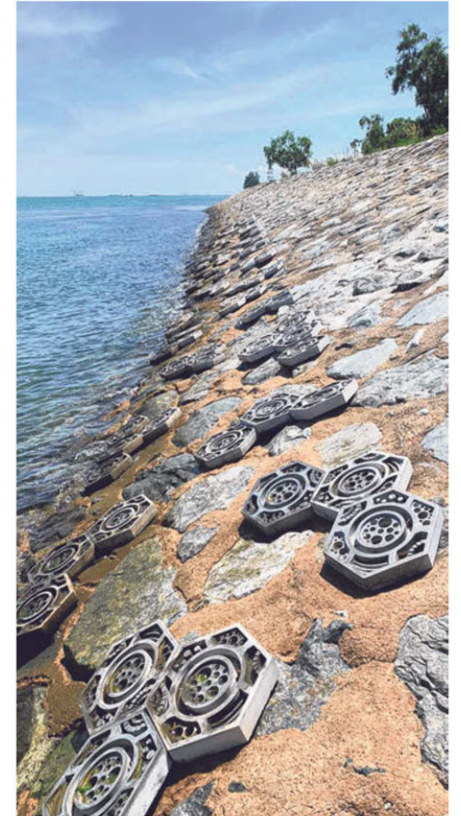
While the marine climate science programme is a major outcome of the MSRDP, it is not the successor.

There is a tendency to believe that unless an environmental project is couched in terms of the existential threat posed by climate change, it is deemed less worthy of support.

Marine science, however, is not just about climate change challenges.

Singapore also has a need to be a responsible steward to sustain a stable marine ecosystem, and this is best achieved through a comprehensive marine science programme.

There are many domains that are important to study, such as pollution and marine invasive species that could disrupt local ecosystems, with regional and global impacts, and independent of the chal-



Tiles to enhance marine biodiversity at Changi Bay. The Marine Science Research and Development Programme has funded 33 projects, including studies on ocean acidification, the resilience of coral reefs in Singapore to environmental change, and how seawalls here can be engineered to enhance biodiversity. PHOTO: PETER TODD

lenges climate change may impose.

As an island state, Singapore should not view its marine environment as a geographic boundary but, instead, as an extension to a larger global economy.

We need to embrace the DNA of our seafaring forefathers, to leverage resources of the sea to a whole new level. To do so demands that marine science be woven back into the fabric of our economy at both regional and global levels, delivering solutions to the marketplace and for societal benefits.

GLOBAL PROBLEMS, LOCAL SOLUTIONS

Dealing with national challenges beyond climate change as a coastal city in symbiosis with its marine environment is not a problem peculiar to Singapore.

More than 60 per cent of the world's population live in coastal areas and about two-thirds of cities with populations greater than 2.5 million are located along coastal areas.

Many coastal cities are struggling to achieve continued viability in the face of over-exploitation or neglect of their marine environments.

In our unique position, Singapore has been able to achieve a good balance between economic development and maintaining a healthy ecosystem with a rich marine biodiversity.

Thus, Singapore's relative success can be a reference model, enhancing the country's thought leadership in marine science and maritime affairs, and providing opportunities for the industry.

The concept of networking across countries to study the marine environment is not new but

is poorly developed in Asia.

Marine laboratories across the United States, including Hawaii, are networked to collect marine data across the Eastern Pacific and Western Atlantic.

There are various programmes within the European Union that not only link marine infrastructure but also involve projects across laboratories to collect environmental data.

These initiatives reflect the importance of large-scale geographic data in environmental science.

Singapore's place in marine sciences has been strengthened substantially by the MSRDP.

To take this success to new levels requires us to think beyond the island. We also need a new paradigm for driving marine science research in Singapore beyond climate change.

Singapore must leverage our strengths and advantages to establish a new regional marine science research programme.

And it should use the MSRDP model of integrating resources to maximise outcomes and take marine research and deliverables for Singapore to a higher level.

stscience@sph.com.sg

Professor Peter Ng is head of the Lee Kong Chian Natural History Museum at the National University of Singapore. He is also director of the Marine Science Research and Development Programme. Professor Staffan Kjelleberg is deputy director of the programme and director of the Singapore Centre for Environmental Life Sciences Engineering at Nanyang Technological University. Dr Serena Teo is facility director at the St. John's Island National Marine Laboratory.



Singapore's Lazarus and Kusu islands. The writers say the island state should not view its marine environment as a geographic boundary, but as an extension to a larger global economy. PHOTO: NATHANIEL SOON

Singapore's place in marine sciences has been strengthened substantially by the Marine Science Research and Development Programme. To take this success to new levels requires us to think beyond the island. We also need a new paradigm for driving marine science research in Singapore beyond climate change.

From top:
Red feather stars extending their oral arms to feed. PHOTO: NATHANIEL SOON
A nudibranch, also known as a sea slug. PHOTO: THE COMPREHENSIVE MARINE BIODIVERSITY SURVEY
A close-up of a sea anemone. PHOTO: NICHOLAS CHEW K.M.
An aerial view of a coral reef. PHOTO: NATHANIEL SOON